

Dietary Changes in Older Americans From 1977 to 1996: Implications for Dietary Quality

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Older people are a rapidly growing segment of the U.S. population. In 1996 persons over age 65 made up 12 percent of the population. As a result, more attention is being paid to their nutritional well-being and health, particularly regarding the possible link between nutrition and the development of chronic disease. The U.S. Department of Agriculture's (USDA) 1977-78 Nationwide Food Consumption Survey and the 1989-91 and 1994-96 Continuing Survey of Food Intakes by Individuals were used to examine the dietary quality of Americans over age 65 and to evaluate changes in their food and nutrient intakes from 1977-78 to 1994-96. Results showed that the largest changes were decreased consumption of whole milk, followed by red meat and eggs, and increased consumption of sweetened beverages, followed by grain mixtures and snacks, and reduced-fat milks. In general, the same nutrients were below the Recommended Dietary Allowances (RDA) during both periods. In 1994-96, intakes of vitamin E and zinc were below the RDA for men and women. Future increases in the consumption of whole grains, nonfat or reduced-fat milks, and vegetables and decreases in sweetened beverages and fats will help improve overall diet quality and help reduce the risk of chronic diseases associated with poor eating patterns.

More attention is being paid to the nutritional status and nutrition-related health needs of older Americans, as well as to the relationship between nutrition and the development of older Americans' many chronic diseases. Older people are a rapidly growing segment of the U.S. population. In 1996, 12 percent of the U.S. population was over age 65; in 1900, 4 percent of the population was over age 65 (18,19). By 2050 the older population will more than double, with most of the growth occurring between 2010 and 2030 when members of the baby-boom generation enter their elderly years (18). Among older Americans, women outnumber men by 6 million (18.9 versus 12.9

million) because of a higher death rate among older men (18,19). It is therefore important to examine the dietary quality of Americans over age 65 and to evaluate changes in their food and nutrient intakes over time. A better understanding of the dietary quality and food and nutrient intakes of elderly Americans will help identify those at nutritional risk and those whose nutritional status may be improved by preventive nutritional interventions. Accordingly, policymakers and nutrition professionals will need to target food and nutrition programs for elders, establish policies related to food fortification, and develop nutrition- and health-related strategies that help elders better meet the nutritional challenges associated with aging.

The importance of proper nutrition throughout the life cycle is key in determining quality of life. Proper nutrition helps to diminish health problems and physiological decline associated with poor diets and poor health habits over a lifetime. And in the later years, good nutrition helps to maintain a more healthful lifestyle and one with greater independence. An increasing percentage of elderly people, as they age, face chronic, limiting illnesses or conditions such as arthritis, poor dentition, reduced gastrointestinal functioning, diabetes, osteoporosis, senile dementia, and depression. These conditions may result in an overall decrease in their intake of food energy and essential nutrients. These conditions will, as well, impair an older person's ability to purchase and prepare nutritious foods, the result of which may be dependency on others for help performing daily activities (6,11).

In general, data on food intake from national dietary surveys (2,14), as well as others (4,12), suggest that older Americans consumed less food than required to meet recommendations for food energy and nutrients. Many older Americans, including the presumably healthy, have reported nutrient intakes below the recommendation for food energy, vitamin E, vitamin B₆, calcium, magnesium, and zinc (14). These low intakes, however, may be a problem of the survey methods used, that is, underreporting of the foods consumed.

Recent findings from the Third National Health and Nutrition Examination Survey (NHANES III) indicate that 18 percent of the men and 28 percent of the women underreported their energy intakes (2). Underreporting of energy intake was highest in women and persons who were older, overweight, or trying to lose weight.

Also, intakes of vitamins, minerals, fiber, and macronutrients were significantly lower and, in general, paralleled energy intakes. Although underreporting of food quantities and food energy has been observed among the elderly, it is not a unique problem of this segment of the population.

Despite underreporting by the elderly, they may actually eat less as they age because of a number of factors, including a decline in physical activity and a decrease in appetite. Also, surveys show that energy intakes are consistently low for the elderly (2,3,12,14,15), suggesting a real decline in food and nutrient intakes with age. This contrasts with a higher mean energy intake by the general population that is seen in the more recent surveys where additional probes were used for purposes of enhancing recall (2,15). Thus despite the limitation of survey respondents underreporting food quantities and food energy, dietary survey data are useful when assessing the dietary quality and food and nutrient intakes of the elderly, and the data provide important information on the nutritional status of the elderly.

This study examines the dietary quality of Americans over age 65 and evaluates changes in their food and nutrient intakes from 1977-78 to 1994-96. Nutrient intakes and consumption of major food groups and subgroups from 1977-96 are examined in terms of current dietary guidance. By increasing our knowledge of the dietary behaviors of older people and observing changes in these behaviors over time, we can more effectively evaluate nutrition education efforts and determine future directions for nutrition intervention, the goal of which is to improve the quality of life for this segment of the population.

Methods

Data Source

Data for this study were from the USDA's Nationwide Food Consumption Survey of 1977-78 (NFCS 77-78) (16,17) and the 1989-91 and 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII) (14,15). The NFCS 77-78 included individuals selected from stratified-area probability samples of noninstitutionalized households in the 48 conterminous States. For the NFCS 77-78 four waves were conducted, one for each season, and each on a different sample of participants (8,9). Individual dietary data for 3 consecutive days were obtained through a mix of a 24-hour recall and 2-day food records.

The CSFII for 1989-91 and 1994-96 comprise a nationally representative sample of noninstitutionalized persons residing in the United States for each year of the 3-year data sets. For the 1989-91 CSFII, the USDA used a 1-day recall and a 2-day dietary record to collect food intake data for 3 consecutive days (14). The 1989-91 CSFII included an all-income and a low-income sample, which were combined through sample weights. For the 1994-96 CSFII, USDA collected 2 nonconsecutive days of dietary data for individuals of all ages.

The data were collected between January 1994 and January 1997; in-person interviews were used to collect the 24-hour recalls. Only the first day of dietary intake data was used because day-1 data (for each of the surveys used) were collected using the 24-hour recall method. Methods of data collection used on subsequent days were not as comparable. Research has indicated that food intake data based on 1-day dietary intakes provide reliable intakes by groups of people (1). Thus, to best examine

changes over time from surveys with different numbers of days of dietary information, this study compared estimates of food and nutrient intake among the surveys based on only the first day's data collected for each individual.

The data were collected from selected individuals in each household. The method for collecting the 24-hour recall was modified from previous surveys to improve the collection of dietary intake data and included more questions that probed the respondents' recollection (15).

Sample

In this study, older men and older women made up 10 to 12 percent of the U.S. population between 1977 and 1996: men, 4 to 5 percent; women, 6 to 7 percent. The sample selected for analysis consisted of persons older than age 65 who provided a valid 1-day, 24-hour recall of dietary intake. For each of the three surveys, the USDA developed sample weights to adjust for survey response and for other vagaries of sample selection. Use of weighted data provides results that are more characteristic and generalizable to the U.S. population.

Nutrient Analysis

This study examined food energy, 15 nutrients, and dietary components. Nutrient data were not available in the NFCS 77-78 for saturated fat, cholesterol, folate, vitamin E, zinc, dietary fiber, and sodium. The nutritive value of the foods the elderly said they consumed was calculated using the USDA's Nutrient Data Bank and survey databases for 1977-78, 1989-91, and 1994-96. Average nutrient intakes for 1 day were computed for these three periods.

Nutrient intakes as a percentage of the 1989 Recommended Energy Allowance (REA) or Recommended Dietary Allowances (RDA) were used in this study.

They were derived by dividing an individual's intake by the REA or RDA for the appropriate age/gender group.

Food Analysis

Ten major food groups (used by USDA) and 27 food items that reflect the total diet were analyzed (table 1). For the CSFII surveys, USDA has developed a Food Grouping System for separating mixtures into their component parts (14). However, in this study, for purposes of comparability between the NFCS and CSFII, food mixtures were not separated into individual ingredients. For example, grain and meat mixtures were placed into a grain or meat mixture category based on the primary ingredient (e.g., a macaroni and cheese mixture was assigned to the grain mixture group; the macaroni was not assigned to the grain group, and the cheese was not assigned to the milk group). Average intake in grams for each of the food groups and subgroups was calculated from 1-day recall for 1977-78 and 1994-96.

Statistical Analysis

Descriptive statistics were derived using the Statistical Package for the Social Sciences (SPSS) (13). Tests for significance were not performed. The differences in the sampling methods of the surveys and the use of sample weights limit the degree to which the survey data can be compared.

For this article, a "trend" was defined as a "change" in the consumption of a food or in nutrient intake. For a given food group (or food), a trend existed when the mean intakes of the food group or food rose or fell continually from 1977-78 through 1989-91 and to 1994-96. Further analysis with more complex methods (i.e., time trends or time series analysis) may reveal additional information.

Both older men and women increased their intakes of vitamins A, C, and B₆; calcium; iron; phosphorus; and magnesium.

Table 1. Percentage change in average intake (grams per day), 1977-78 to 1994-96, for Americans over age 65

	NFCS 1977-78 Men	NFCS 1977-78 Women	CSFII 1994-96 Men	CSFII 1994-96 Women	Men	Women
Sample size	1,514	2,167	1,101	1,026		
	<i>Grams</i>				<i>Percent change</i>	
Total meat	223	155	204	151	-9	-3
Red meat	82	51	39	24	-52	-53
Luncheon meats	21	11	21	13	0	18
Poultry	27	24	22	22	-19	-8
Fish	10	9	15	12	50	33
Mixtures	67	46	102	77	52	67
Total milk and milk products	253	216	260	211	3	-2
Total fluid milk	210	157	185	148	-12	-6
Whole milk	109	75	43	29	-60	-61
Reduced-fat milks	53	51	93	70	65	37
Cheese	14	17	15	13	8	-24
Milk desserts	24	20	37	28	54	40
Eggs	39	21	21	15	-46	-29
Legumes, nuts, and seeds	28	16	42	26	50	63
Total grains	232	182	301	232	30	27
Breads and rolls	65	49	61	48	6	-2
Other baked goods	65	45	48	35	-26	-22
Cereals and pasta	67	55	102	71	52	29
Grain snacks	3	3	8	6	167	100
Mixtures	31	31	64	57	106	84
Total vegetables	248	219	252	210	2	-4
White potatoes	72	57	66	47	-8	-18
Tomatoes	29	29	35	30	21	3
Dark-green vegetables	11	12	16	18	45	50
Deep-yellow vegetables	12	15	15	11	25	-27
Other vegetables	123	106	120	104	-2	-2
Total fruits	169	177	214	195	27	10
Citrus	66	74	79	78	20	6
Other fruits	103	103	130	113	26	10
Fats and oils	15	12	17	14	13	17
Table fats	9	6	7	5	-22	-17
Salad dressing	6	4	9	9	50	125
Sugars and sweets	30	20	23	18	-23	-10
Nonalcoholic beverages	617	571	717	629	16	10
Coffee	443	374	419	344	-5	-8
Tea	117	141	131	147	12	4
Carbonated soft drinks	41	41	121	93	195	127
Fruit drinks	16	17	44	39	165	129

Note: Food item totals may not equal food group totals because of rounding.

Table 2. Mean nutrient intakes by gender for older Americans over age 65, 1977 to 1996

	1977 ¹ Men	1977 ¹ Women	1989-91 ² Men	1989-91 ² Women	1994-96 ³ Men	1994-96 ³ Women
Sample size	1,037	1,726	780	1,377	1,101	1,026
	<i>Mean</i>					
Food energy (kcal)	1,910	1,401	1,823	1,392	1,854	1,407
Total fat (gm)	88.3	61.6	68.2	51.9	68.3	50.2
Saturated fat (gm)			23.6	17.6	22.5	15.9
Cholesterol (gm)			284	194	256	185
Dietary fiber (gm)			17.5	13.5	18.6	14.0
Vitamin A (IU)	6,338	6,015	8,505	7,651	8,613	6,464
Vitamin C (mg)	87	87	110	102	107	95
Vitamin B ₆ (mg)	1.63	1.30	1.9	1.5	1.98	1.53
Vitamin E (mg)			8.7	7.1	8.9	6.7
Folate (µg)			309	240	298	222
Calcium (mg)	709	555	733	596	778	587
Iron (mg)	12.7	9.4	16.3	12.0	16.6	12.6
Phosphorus (mg)	1,194	897	1,204	927	1,214	940
Magnesium (mg)	257	202	287	224	291	229
Zinc (mg)			13.0	8.6	11.0	8.3
Sodium (mg)			3,275	2,263	3,179	2,344

¹Mean intakes per individual in a day, 1-day data, 1977-78 NFCS.

²Mean intakes per individual in a day, 1-day data, 1989-91 CSFII.

³Mean intakes per individual in a day, 1-day data, 1994-96 CSFII.

Results

Changes in Average Daily Nutrient Intakes, 1977-96

From 1977-96, older men's average intakes of food energy decreased (1,910 to 1,854 kcal); older women's intakes remained essentially unchanged (1,401 to 1,407 kcal) (table 2). These intakes are below the 1989 REA for men (2,300 kcal) and women (1,900 kcal) (7). Both older men and women increased their intakes of vitamins A, C, and B₆; calcium; iron; phosphorus; and magnesium. They decreased their intake of total fat: men by 20 grams and women by 11 grams. From 1989-96 intakes of dietary fiber

increased slightly; intakes of folate, saturated fat, and cholesterol decreased. Also, intakes of zinc and sodium for men were lower in 1994-96 than they were in 1989-91.

Average Intakes as a Percentage of Recommendation, 1977-96

Older Americans' diets failed to meet the 1989 REA for food energy for each of the survey years, with women's intake less than 75 percent of the REA (table 3). Both older men and women exceeded the recommendation for total fat (107 to 129 percent) and for saturated fat (103 to 118 percent) for all years. However, total fat and saturated fat intakes as a

percentage of recommendation declined, an indication that in the past decade some progress was made in achieving the goals for fat intake. Whereas both older men and women met the cholesterol recommendation (300 milligrams or less per day), only older women met the sodium recommendation (2,400 milligrams per day). Older men and women failed to meet the dietary fiber recommendation of 25 grams per day: intakes ranged from 54 to 74 percent of the recommendation. Older men and women also failed to meet 100 percent of the RDA for vitamin B₆, vitamin E, calcium, magnesium, and zinc. In 1994-96, calcium and zinc intakes for the

Table 3. Average intake as percentage of recommendation by gender for older Americans over age 65, 1977 to 1996

	1977 ¹ Men	1977 ¹ Women	1989-91 ² Men	1989-91 ² Women	1994-96 ³ Men	1994-96 ³ Women
Sample size	1,037	1,726	780	1,377	1,101	1,026
	<i>Percent</i>					
Food energy ⁴	83	74	79	73	82	74
Total fat	129	129	112	112	111	107
Saturated fat			118	113	110	103
Cholesterol			95	65	85	62
Dietary fiber			70	54	74	56
Vitamin A	127	150	170	191	181	183
Vitamin C	144	146	182	169	172	160
Vitamin B ₆	82	81	96	93	99	95
Vitamin E			87	89	88	82
Folate			154	133	143	128
Calcium	89	69	92	74	96	75
Iron	127	94	163	120	167	125
Phosphorus	149	112	150	116	153	117
Magnesium	73	72	82	80	83	82
Zinc			87	72	77	70
Sodium			136	94	132	98

¹Mean intakes per individual in a day, 1-day data, 1977-78 NFCS.

²Mean intakes per individual in a day, 1-day data, 1989-91 CSFII.

³Mean intakes per individual in a day, 1-day data, 1994-96 CSFII.

⁴Nutrient recommendations are based on the 1989 Recommended Dietary Allowances; total fat is ≤ 30 percent of total calories; saturated fat is < 10 percent of total calories. Dietary fiber is based on daily intake of 25 grams; sodium, 2,400 milligrams; and cholesterol, ≤ 300 milligrams.

elderly women were 75 percent or less of the RDA. Despite these shortfalls, intakes of calcium, vitamin B₆, and magnesium were higher in 1994-96 than they were in 1977-78 and contributed to meeting a greater percentage of the recommendation.

The Percentage of Older Americans With Diets Meeting 100 Percent of the Recommendation, 1977-96

The percentage of older men and older women with intakes of food energy that met 100 percent of the REA was low:

25 and 17 percent, respectively in 1994-96, and it essentially remained the same over the 20-year period (table 4). From 1977-78 to 1994-96, the percentage of older men and women meeting 100 percent of the recommendation for intakes of total fat, vitamin B₆, and iron increased notably. In 1989-91 and 1994-96, a higher percentage of older women than older men met 100 percent of the recommendation for nutrients that need to be consumed in moderation: Total fat, saturated fat, cholesterol, and sodium. The percentage of older men and

women meeting 100 percent of the recommendation for mineral intake (calcium, magnesium, and zinc) was low throughout the study period.

Changes in Average Intake (in grams per day) from 1977-96

Total meat products. In 1994-96 older Americans ate less total meat and 50 percent ate less red meat (beef and pork) than they did in 1977-78 (table 1). Not expected was the decrease during this period in poultry consumption by older Americans (19 percent less for men and

Table 4. Percentage of older Americans by gender over age 65, with diets meeting 100 percent of the recommendation for intake, 1977 to 1996

	1977 ¹ Men	1977 ¹ Women	1989-91 ² Men	1989-91 ² Women	1994-96 ³ Men	1994-96 ³ Women
Sample size	1,037	1,726	780	1,377	1,101	1,026
	<i>Percent</i>					
Food energy ⁴	26	16	21	13	25	17
Total fat	13	18	36	39	37	43
Saturated fat			40	43	43	50
Cholesterol			62	83	67	80
Dietary fiber			20	6	20	11
Vitamin A	40	46	49	51	50	51
Vitamin C	57	58	64	67	62	61
Vitamin B ₆	26	27	37	36	42	38
Vitamin E			23	26	27	28
Folate			62	58	60	57
Calcium	27	17	36	21	40	22
Iron	65	37	69	51	76	56
Phosphorus	80	55	77	58	80	62
Magnesium	17	19	25	23	28	27
Zinc			21	19	20	17
Sodium			30	61	33	55

¹Mean intakes per individual in a day, 1-day data, 1977-78 NFCS.

²Mean intakes per individual in a day, 1-day data, 1989-91 CSFII.

³Mean intakes per individual in a day, 1-day data, 1994-96 CSFII.

⁴Nutrient recommendations are based on the 1989 Recommended Dietary Allowances; total fat is ≤ 30 percent of total calories; saturated fat is < 10 percent of total calories. Dietary fiber is based on daily intake of 25 grams; sodium, 2,400 milligrams; and cholesterol, ≤ 300 milligrams.

8 percent less for women). The average intake of fish and meat mixtures, however, increased substantially. Because meat mixtures may include appreciable amounts of red meat or poultry, actual consumption of these discrete foods may be higher than the individual food items indicate.

Total milk products. A noticeable shift from whole milk to reduced-fat milks occurred between 1977-78 and 1994-96, with the elderly drinking 60 percent

less whole milk and 37 to 65 percent more reduced-fat milks. Despite this shift in milk types during this period, both older men and women consumed less fluid milk overall.

Eggs; legumes, nuts, and seeds. From 1977-78 to 1994-96, egg consumption decreased for both elderly men and women—more so for the men than for the women: -46 versus -29 percent. This is in contrast to the increased consumption of legumes, nuts, and seeds: 50 percent for men and 63 percent for women.

Total grains. Older men and women ate more grain products, especially grain mixtures and snacks (i.e., pizzas and pretzels), in 1994-96 compared with 1977-78. They also ate more cereals and pastas, with the change in men's intake double that of women's: 52 versus 29 percent.

Total vegetables and total fruits. Total vegetable intake between 1977 and 1996, on average, remained relatively constant for elderly Americans—they ate less white potatoes but more tomatoes

Older Americans may be at risk for micro-nutrient deficiencies....

and deep-green vegetables. Older men and women consumed about 50 percent more dark-green vegetables and older men about one-fourth more deep-yellow vegetables and one-fifth more tomatoes. Also, older men and women ate more total fruit, with their intake of both citrus and noncitrus fruits higher in 1994-96 than in 1977-78.

Fats and oils. Elderly Americans ate slightly more fats and oils in 1994-96 than they did in 1977-78, with a shift from table fat to salad dressings. For both men and women, their use of table fats (margarine and butter) in 1994-96 was about one-fourth less than their use in 1977-78.

Nonalcoholic beverages. While older Americans ate less sugar and sweets in 1994-96 than they did in 1977-78, their consumption of carbonated soft drinks and fruit drinks increased appreciably, counterbalancing the positive effects of consuming less sugar and sweets.

Discussion and Conclusions

Older Americans appear to be moving towards dietary guidance and closer to the *1995 Dietary Guidelines for Americans* by incorporating nutrition education messages into healthful eating behaviors. From 1977-78 to 1994-96, older Americans made considerable changes in their diets. In 1994-96, their consumption of red meat, eggs, and sugars and sweets was lower than it was in 1977-78. Their consumption of legumes, total grains, and fruits was higher in 1994-96 than it was in 1977-78. This selection of food provided less fat, saturated fat, cholesterol, zinc, and sodium to their diet and more vitamins A and C, folate, dietary fiber, calcium, and other bone-related nutrients.

Despite these dietary changes, average intakes of food energy, dietary fiber, vitamins B₆ and E, calcium, magnesium, and zinc were lower than recommendations. In particular, low calcium intakes are a concern for both older men and women, especially in terms of bone health. The declining use of fluid milk products, coupled with the increasing use of soft drinks and fruit drinks is a troubling trend. The consumption of soft drinks and fruit drinks is likely to displace more nutritious foods (e.g., milk products and fruits) from the diet and negatively affect diet quality.

Also, low intakes of dietary fiber and zinc require attention. While the intake of dietary fiber may be due to the low food energy intakes of this sample, these intakes are considerably below intakes expected of individuals consuming the recommended servings of fruits, vegetables, and whole-grain foods, based on the Food Guide Pyramid.

Older Americans have included more of these foods in their diets over the past 10 years. They, however, must continue to make more appropriate food choices and work harder to meet nutrient recommendations by increasing the number of servings of fruits, vegetables, and whole grains consumed, as well as by increasing their servings of milk and meat products. For example, including plenty of fortified cereal foods in the daily diet may counterbalance the loss of zinc from red meat and may also make important contributions to their intakes of magnesium and folate—thereby improving dietary quality. Overall, the low intake of food energy may prevent the older American from achieving the balance of foods needed for optimal diet quality, as indicated by the many nutrients below the recommendation.

In addition, the older Americans' marginal and low dietary intakes of many minerals and vitamins are a concern. Older Americans may be at risk for micronutrient deficiencies not only from low dietary intakes but also from other non-food factors, such as the ability to buy and prepare food, the presence of disease, or limited income. While the marginal and low dietary intakes of some nutrients (vitamin E, calcium, magnesium, and zinc) in this study are suggestive of clinical deficiencies, such a risk has not been confirmed by biochemical or clinical markers. However, studies using biochemical markers provide some evidence regarding the link between low dietary intake and biochemical status.

The Boston Nutritional Status Survey of the Elderly and related work (10,12) suggest that older people, even in a relatively well-off and generally well-nourished population, may not be getting as much vitamins as they need. For example, plasma levels of pyridoxal phosphate and other measures of vitamin B₆ status have been shown to decline with age. Erythrocyte activity (ETK-AC), a biochemical marker of thiamin, has shown a significant relationship between thiamin intake and blood levels. Using this marker, the researchers in the Boston study (12) categorized 5 percent of the study population as deficient, but the study noted that a correlation is more likely to exist between ETK-AC value and supplemental thiamin than between ETK-AC and dietary thiamin. Also, intake of riboflavin has been shown to have a significant effect on the erythrocyte glutathione reductase activity¹ coefficient (EGR-AC) in the population regardless of gender—with a deficiency noted in 5 to 16 percent of elderly people in technologically advanced countries (10).

¹A biochemical marker of riboflavin activity.

For folate, the concentration of folate in erythrocytes is considered a better indicator of folate stores in the tissue. Serum levels accurately reflect recent dietary intake. Currently, the level of homocysteine is linked to a person's folate status, with serum homocysteine levels correlated closely with folate intakes less than 400 µg per day.

As with vitamins, the dietary intake of minerals also has shown a correlation with biochemical markers. Phosphorus intakes relate closely to blood phosphorus levels as does dietary iron and its storage to plasma ferritin levels (12). The requirements for calcium in terms of bone mineral loss over time have been linked to the biochemical marker, 25-hydroxy vitamin D—the levels of which are lower in older persons than in younger persons (10).

An older person's risk for inadequate dietary intake is well established. The results presented from this study emphasize the fact that the quality of older Americans' diet continues to need improvement. Nutrition intervention strategies need to be developed that improve nutrient intake for the older American. These strategies should emphasize the total diet and overall diet quality; they should help reduce the risk of chronic diseases associated with poor eating patterns. A diet needs to be low in fat and saturated fat and contain foods that provide adequate amounts of essential minerals, vitamins, and dietary fiber. For older people, efforts should be targeted to increase their intakes of food energy, dietary fiber, vitamin E, folate, calcium, magnesium, and zinc.

Limitations of Study

This study has two major limitations in terms of the implications presented: (1) the survey data and (2) the use of the RDA versus the Dietary Reference Intake (DRI) for assessment of dietary quality.

Survey data. The survey design and nutrient databases, underreporting by survey respondents, and the use of 24-hour recall data are included in this limitation. The use of different surveys and nutrient databases may make the data of the earlier years less comparable to the data of later years, especially in terms of the intake of fat and cholesterol and possibly folate. The nutrient data for the later surveys reflect improved data as well as changes in the nutrient content of foods that are attributable to new varieties and species, to new fortification levels, and to changes in the practices of the food industry.

Dietary intake was assessed using data from 24-hour recalls. Such data are poor indicators of a given person's usual diet but are more useful to characterize a group's intake when the sample size is sufficient (5). When providing dietary information, survey respondents tend to underreport consumption of certain foods, especially those foods high in fat and calories; they also tend to overreport consumption of foods (e.g., fruits) that are high in nutrients. Underreporting has decreased somewhat in more recent surveys (CSFII 94-96 and NHANES III) because more probes and collection methods have been added. Underreporting, however, remains a problem in certain subgroups, primarily women and persons who are older, overweight, or on a diet to lose weight. Additional research is

needed to determine the extent of underreporting of foods consumed, food-preparation methods and ingredients, food quantities, and the effect of under-reporting on estimates of food and nutrient intakes (2).

RDA vs. DRI. Adopted by the Food and Nutrition Board, Dietary Reference Intakes (DRI) represent the new approach to providing quantitative estimates of nutrient intakes for use in a variety of settings, thus replacing and expanding on the past 50 years of periodic updates and revisions of the RDA. The new DRI differ in amounts and age categories from the 1989 RDA and include three new categories of reference values: Adequate Intake (AI), the Estimated Average Requirement (EAR), and the Tolerable Upper Intake Level (UL).²

The design of this study does not allow calculation of the percentage of AI for calcium or calculation of the percentage of RDA for phosphorus, magnesium, folate, or vitamin B₆. However, older Americans' mean intake of these nutrients as a percentage of their DRI differs from their mean intake as a percentage of the 1989 RDA. Compared with the higher calcium AI value (1,200 mg/d for men and women age 51 and older), mean intake for both men and women met a much lower percentage of the DRI than for the 1989 RDA. This is also observed for the mean intakes of magnesium and folate, with a higher DRI magnesium RDA value (420 mg/d for men and 320 mg/d for women age 51 and older) and a higher DRI folate RDA value (400 µg/d for men and

women age 51 and older), respectively than for the 1989 RDA. The mean intake of phosphorus met a higher percentage of the DRI (700 mg/d for men and women age 51 and older) than of the 1989 RDA. Also, mean intakes of vitamin B₆ met a higher percentage of the DRI (1.7 mg/d [RDA] for men and 1.5 mg/d [RDA] for women) than of the 1989 RDA, with older men and women in 1994-96 exceeding the DRI.

²The EARs and AIs for the elderly may reflect a greater variability in requirement, especially for nutrient-related energy expenditures (20).

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